

Electrochemical deposition of calcium phosphates in polyvinyl alcohol

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Synthesis of calcium phosphates in aqueous-polymeric media is one of the methods for regulation of their phase composition, structure and physiochemical properties [1–5]. The aim of this work is to obtain calcium phosphates in polyvinyl alcohol (PVA) media by a chemical interaction of Ca^{2+} with HPO_4^{2-} ions and to deposited calcium phosphates with electrochemical methods on the titanium substrate from aqueous solutions containing PVA, Ca^{2+} and H_2PO_4^- ions. Composite films based on brushite and PVA were prepared by the treatment of PVA– CaCl_2 film with $(\text{NH}_4)_2\text{HPO}_4$ solution at a ratio of $\text{Ca} : \text{P} = 1.67$ and pH 7–8 (Fig. a). Treatment of brushite / PVA films by ammonia solution (pH 10–11) leads to the transformation of brushite to amorphous calcium phosphate. Electrochemical deposition on a titanium substrate in $\text{CaCl}_2 / \text{NH}_4\text{H}_2\text{PO}_4 / \text{PVA}$ electrolyte with a ratio of $\text{Ca} : \text{P} = 1.67$ and pH 3–5 was used for the preparation of composite coatings consisting of brushite and basic calcium phosphate particles distributed in PVA film (Fig. b). Brushite and portlandite particles were deposited in PVA films under constant current ($20 \text{ mA} / \text{cm}^2$) during 10–20 min. Brushite, octacalciumphosphate and hydroxyapatite particles were prepared at a constant voltage (20 V) during 10–30 min. The films enriched with basic calcium phosphates can be used as bio-coatings on implants for improving their degree of osseointegration.

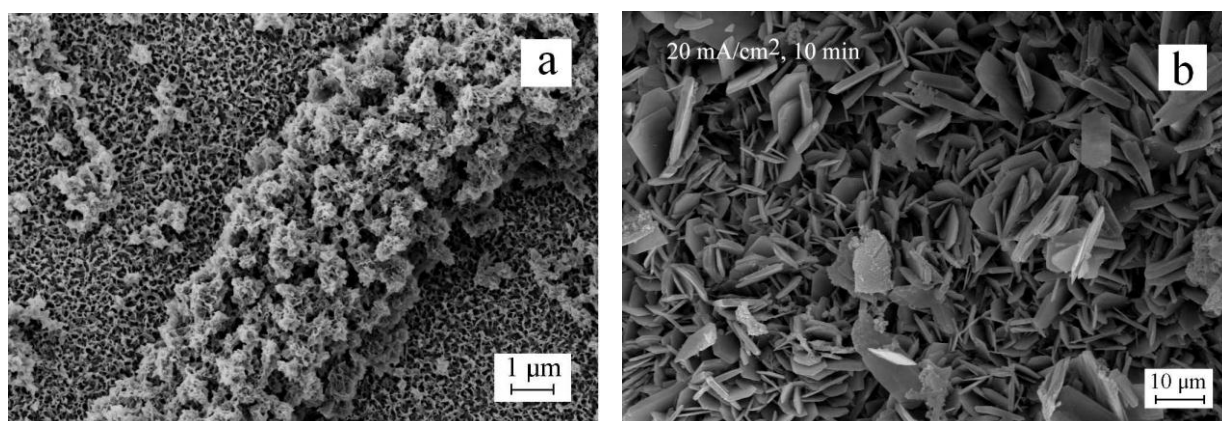


Fig. SEM images of calcium phosphates composite films (a) and coatings (b) in PVA media

References

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